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L1: Entry 138 of 191 File: USPT Jul 12, 1994

DOCUMENT-IDENTIFIER: US 5328561 A
TITLE: Microetchant for copper surfaces and processes for using same

Abstract Text (1):
An alkaline solution for the microetching of copper in the course of printed circuit manufacture is provided by combining components which are a source of cupric ion, ammonium hydroxide and/or a source of ammonium ion, and a compound, other than ammonia, which is a chelator for cupric ion in the alkaline environment of the solution. The microetchant composition is stable, brings about a desired microroughening of the copper surface with minimal removal of copper, is easily regenerated, and does not promote pink ring. When an organosilane through-hole conditioning agent is included in the composition, the composition can be used as a means for effecting in one step the microetching and conditioning steps of a printed circuit through-hole metallization process.

Brief Summary Text (2):
The present invention relates generally to the fabrication of printed circuits; more particularly to compositions for microetching copper surfaces in the course of fabricating a printed circuit; and still more particularly to printed circuit fabrication processes employing the copper microetching compositions in admixture with through-hole conditioners.

Brief Summary Text (3):
There are a wide variety of techniques employed for fabricating printed circuits, be they single-sided or double-sided circuits, multilayer circuits, rigid or flexible circuits, or the like. In a great many fabrication techniques, a necessary step in the fabrication sequence involves the controlled microetching of a copper surface, generally for purposes of preparing the copper surface for some subsequent step, such as the provision thereon of a coating layer of metal, organic resist or masking material, or the like.

Brief Summary Text (4):
This surface microetching is in distinct contrast to the process of "copper etching" which is common to all subtractive processes for fabricating printed circuits, i.e., wherein the object is the complete removal (etching away) of selected copper areas from the underlying substrate surface. Instead, the general aim of copper microetching is the controlled removal of only a very small amount of copper from the surface (e.g., removal of only about 0.5 to 3 microns thickness from a copper layer of 30-40 microns thickness), and in a manner which results in a remaining exposed copper surface which is topographically altered (e.g., microroughened) as compared to the original copper surface.

Brief Summary Text (7):
The foregoing are just a few examples of the many sequences in which there is employed a microetch of a copper surface in the course of fabricating a printed circuit. Other examples include the microetching of copper surfaces to improve adhesion thereto of organic plating or etch resists, microetching of copper surfaces to improve adhesion thereto of other metal deposits (e.g., electrolytic copper, tin-lead etch resists, etc.), microetching of copper surfaces to improve adhesion thereto of solder masks, and the like.

Brief Summary Text (8):

The copper microetchants heretofore employed in the art are acidic compositions, and the most widely employed of these are mixtures of hydrogen peroxide with mineral acids, and mixtures of acids with other strong oxidizers such as the persulfates. While these compositions are effective for achieving the desired controlled microetching of copper surfaces, they are not without disadvantages. One problem is that the compositions are highly unstable, and break down continuously even upon sitting idle. Another problem is that these acidic compositions contribute to the so-called "pink ring" phenomenon when used as copper microetchants in sequences for metallizing through-holes in multilayer printed circuits. As earlier noted, copper oxide conversion coatings are commonly employed as adhesion promoters for the innerlayer circuitry-to-resin bonding needed to provide an integrally bonded multilayer circuit. When through-holes are drilled, the edges of innerlayer circuits are there 10 exposed and the processing chemicals for metallizing the through-holes thus have access to the innerlayer edge areas. The copper oxide adhesion promoter is generally soluble in acid, so acidic processing chemicals for through-hole metallization (such as the acidic copper microetchants) promote localized dissolution of the oxide layer about the periphery of the hole. The dissolution evidences itself as a "pink ring" by virtue of the pink color of the underlying copper metal which is exposed as the copper oxide dissolves therefrom. This localized loss of adhesion promoter (which also can occur at non-hole edge areas of the circuit) can in turn lead to localized delamination in the multilayer circuit, an essentially fatal defect.

Brief Summary Text (9):
While an alkaline copper microetchant would be advantageous in this regard, no such suitable compositions have heretofore been available. Alkaline solutions are known and available for completely etching copper from an underlying substrate surface, as earlier described (also sometimes referred to as "final" etchants or "primary" etchants), such as ammoniacal copper solutions. However, these known solutions in particular, as well as most other known final etchants such as acid-based ferric or copper chloride solutions, are highly unsuitable for copper microetching. In particular, these etchants are extremely difficult to control (i.e., to remove only a very small portion of copper as opposed to a complete removal of all copper); more fundamentally, even to the extent a degree of control can be achieved so as to obtain less than complete removal of copper, the copper surface they produce is undesirably smooth and lacks the microroughened topography essential to the subsequent fabrication steps.

Brief Summary Text (10):
Another drawback of the known acid-based copper microetchants is related to a recent trend in the printed circuit fabrication art towards attempts to reduce the number of separate processing steps needed in the fabrication sequence. In particular, sequences for the metallization of through-holes traditionally require a number of separate steps such as (a) contact of the printed circuit board and hole surfaces with an oxidizing agent to remove resin smear from innerlayer circuitry edges exposed at the hole surfaces and/or to etch resin back from innerlayer edges at hole surfaces and/or to topographically alter the resin surfaces of the holes; (b) contact with a neutralizer to neutralize residual oxidizing species from step (a); (c) contact with a so-called through-hole conditioner which promotes adherence to the through-hole surfaces of subsequently-applied catalyst species; (d) copper microetching; (e) contact with species catalytic to subsequent metal depositing; and (f) contact with a suitable metal depositing solution. Efforts to reduce the number of such steps, by combining together in one composition components which will thus effect in one step two or more of the necessary functions, have included combination of neutralizing and microetching steps, and combination of neutralizing, conditioning and microetching steps. See, e.g., U.S. Pat. No. 4,751,106 and 5,104,687, both incorporated herein by reference.

Brief Summary Text (11):
While the goal of these patents is commendable, the efforts to date are plagued with problems. Specifically, in the aforementioned U.S. Pat. No. 4,751,106, the combination of neutralizing and microetching functions necessarily is constrained to the use of an acidic hydrogen peroxide solution, i.e., the conventional acidic copper microetchant as earlier discussed, which also serves as a neutralizer (reducing agent) for permanganate species utilized in the preceding oxidizing step. In the aforementioned U.S. Pat. No. 5,104,687, the combination of neutralizing, conditioning and microetching steps also is strictly constrained to use of acidic hydrogen peroxide (for neutralizing and microetching), and is further constrained to use of a very specific class of throughhole conditioners, i.e., cationic

polyelectrolytes. The requirement for acidic hydrogen peroxide in these processes necessarily brings into play the stability problems and pink ring problems earlier discussed. The further requirement for cationic polyelectrolyte, which according to U.S. Pat. No. 5,104,687 is the only through-hole conditioner compatible with its combined neutralizer-microetchant system, essentially prevents the process from being of any commercial interest, because these conditioners have serious drawbacks in metallization processes per se, and particularly as contemplated in the proposed combination of materials and steps.

Brief Summary Text (15):
It is an object of the present invention to provide an alkaline composition effective for microetching copper surfaces in the course of process sequences for fabricating a printed circuit.

Brief Summary Text (16):
Another object of the invention is to provide printed circuit fabrication sequences which utilize the foregoing copper microetching composition.

Brief Summary Text (17):
Yet another object of the invention is to provide compositions effective both for microetching copper surfaces and for conditioning through-hole surfaces for metallization, and to provide through-hole metallization sequences having a reduced number of processing steps through use of such compositions.

Brief Summary Text (18):
These, and other objects as will be apparent, are achieved through the provision of a copper microetching composition in which there are combined, in aqueous alkaline solution, components comprising a source of cupric ion, ammonium hydroxide and/or a source of ammonium ion, and a copper chelator other than ammonia, in concentrations effective to microetch copper surfaces, typically at a rate not in excess of about 1.2 microns per minute.

Brief Summary Text (19):
The foregoing composition has numerous advantages in the context of the copper microetching which is practiced at one or more stages of printed circuit fabrication, not the least of which are its stability and its alkaline nature. Thus, in contrast to the known acidic microetchants for copper, the composition of the invention has essentially no dissolution effect on typical copper oxide adhesion promoters employed in multilayer printed circuits, and thus does not contribute to pink ring formation and localized delamination.

Brief Summary Text (22):
A particularly important advantage of the composition of the invention is its compatibility, and combinability, with other compounds finding use in sequences for fabricating printed circuits, thereby enabling a reduction in the processing steps required in such sequences. One example of this advantage is in the inclusion in the microetchant composition of any of a wide variety of surfactants effective to clean copper surfaces of soils, oils, fingerprints, etc. As is well known, alkaline cleaning solutions are far more effective than acidic cleaners in this regard; by providing a microetchant for copper which is alkaline, the invention in turn, then, provides a highly suitable vehicle for inclusion of effective cleaners so as to arrive at a composition excellently functional for both microetching and cleaning. Since a cleaning step often is required in those printed circuit fabrication sequences which include a microetching step, it becomes possible then to eliminate such cleaning as a distinct step.

Brief Summary Text (24):
for metallizing through-holes, as set forth in U.S. Pat. No. 4,976,990, incorporated herein by reference. As also taught in that patent, however, these organosilanes function most effectively when employed in at least slightly alkaline solution. As such, it has not heretofore been possible to combine these through-hole conditioners with microetchants for copper as a means for reducing processing steps, inasmuch as the microetchants known and used in through-hole metallization sequences are acid-based. By providing an effective alkaline copper microetchant, the present invention enables its combination per se with these organosilane conditioners, with the further surprising result that the components of the microetchant do not interfere with, nor detract from, the function of the

organosilanes as conditioners, and vice-versa. As such, the invention provides through-hole metallization sequences in which the required copper microetching and through-hole conditioning are combined into a single step; in contrast to other efforts towards this end, the invention provides this step reduction while using the most beneficial means for achieving both functions, i.e., without being constrained to use of acidic microetchants or inferior conditioners.

Brief Summary Text (25):
Still further in these regards, the microetchant composition is such that it can be used to combine functions, in a single composition for use in a single step, of copper microetching, cleaning and through-hole conditioning.

Detailed Description Text (3):
The essential reaction mechanism for the microetching of copper metal using this composition is one of disproportionation, i.e.,

Detailed Description Text (8):
The microetchant composition may of course contain additional components, whether as pH adjusting agents, buffers or the like, so long as no adverse effect on the essential microetching function per se is realized. As earlier noted, particular embodiments of the invention will involve inclusion in the composition of cleaners and/or organosilane through-hole conditioners.

Detailed Description Text (10):
The microetchant composition typically will be employed at a temperature in the range of from about 85.degree. F. to about 130.degree. F., more preferably from about 100.degree. F. to about 120.degree. F., and in an immersion technique in which the printed circuit material, containing the copper surfaces to be microetched, is immersed in a suitable vessel containing the microetchant. Spray operation also is possible, however. The contact time between the copper surfaces and the microetchant solution will vary according to the extent of microetching desired, but typically will be in the range of from about 1 to about 10 minutes, more typically from about 4 to about 6 minutes.

Detailed Description Text (11):
The formulation of the microetchant composition is such that it effects the microetching in a controlled manner, i.e., at a rate which is not so rapid, and in a manner which is not so aggressive, as to undesirably remove too substantial an amount of copper and/or as to undesirably produce a copper surface which is insufficiently microroughened, a situation which often occurs using aggressive etchants. Most desirably, the composition is formulated so as to achieve a rate of etching which is no greater than about 1.2 microns/minute, and moreover which is effective to develop on the copper surface the desired microroughened topography after removal of only about 0.125 microns of copper.

Detailed Description Text (12):
As has previously been noted, the alkaline microetchant composition of this invention is effective for use in all printed circuit fabrication sequences in which the microetching of copper surfaces (used herein to refer also to copper alloys or intermetallics), be they copper foil or electroless copper or electrolytic copper, is a required process, whether in preparation of the copper surface for a subsequently applied metal or organic coating or for any other purpose.

Detailed Description Text (18):
The next step in the process is copper microetching, already extensively discussed, although in situations where organosilanes are employed it is possible to carry out the microetching prior to the conditioning step. In any event, it is at this stage in a traditional hole metallization sequence that the alkaline microetchant composition of the invention will be employed to achieve the requisite microetching of the copper surfaces, with all the advantages earlier described.

Detailed Description Text (21):
In particular, the provision of an alkaline microetchant for copper enables the combining with it of the organosilane through-hole conditioning agents of U.S. Pat. No. 4,976,990, whereas heretofore any hole metallization sequence seeking to make use of these highly advantageous conditioners necessarily had

to provide for separate microetching and conditioning steps (and with water rinses therebetween) owing to the incompatability between acid-based microetchants and organosilane conditioners. According to this aspect of the invention, then, the earlier-described alkaline microetchant composition is formulated so as to further comprise one or more of the organosilane conditioners, typically at concentrations of from about 0.5 to 30 g/l, and at a composition pH in the range of from about 7.5 to about 11. This composition is then employed in contact with the through-hole-containing printed circuit material, and is found effective to bring about simultaneous microetching and through-hole conditioning, and indeed without any substantial difference in microetching or conditioning as found in making separate use of the microetchant and the organosilane conditioner. The contact time and conditions earlier set forth for microetching with the microetchant composition per se are also suitable for bringing about microetching and conditioning using the microetchant composition containing organosilane.

CLAIMS:

1. A process for microetching a copper surface to remove copper therefrom and produce a remaining copper surface which is microroughened, comprising contacting said copper surface with a composition comprising the combination, in an aqueous solution, of components comprising a source of cupric ion, ammonium hydroxide and/or a source of ammonium ion, and a chelator for cupric ion other than ammonia selected from the group consisting of monoethanolamine, ehtylenediamine tetraacetic acid, salts of ethylenediamine tetraacetic acid, and mixtures thereof, said contacting beign at a composition temperature of from 85.degree. F. to 130.degree. F., and for a time, and at conditions, effective to achieve such microroughening.

9. In a process for providing the surfaces of through-holes with a metal coating incident to the fabrication of a printed circuit, wherein a printed circuit material containing through-holes is subjected to steps of microetching, conditioning and metal coating, the improvement comprising effecting said microetching and said conditioning in a single processing step employing an aqueous alkaline solution which comprises a source of cupric ion, ammonium hydroxide and/or a source of ammonium ion, a chelator for cupric ion other than ammonia, and an organosilane through-hole conditioner.

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L1: Entry 149 of 191 File: USPT Nov 3, 1992

DOCUMENT-IDENTIFIER: US 5160579 A
TITLE: Process for manufacturing printed circuit employing selective provision of solderable coating

Detailed Description Text (5):
The next step in the process is the metallization of the through hole surfaces to provide the structure shown in FIG. 1B wherein a copper layer 14 is provided over the through hole surfaces and over the copper foil cladding 12. The metallization is preferably by way of electroless copper deposition and will include the well known preparatory step of catalytic activation of the surfaces with, e.g., palladium-tin sols or solutions, prior to immersion of the board in the electroless copper depositing bath. For multilayer circuits, the through hole metallization process will also generally include steps for desmearing and/or etching back the through holes prior to catalytic activation, and for all circuits the preparation will generally also include various cleaning, glass fiber etching, conditioning, microetching and other steps before activation and electroless copper deposition. All these techniques are well known in the art and are not further elaborated upon herein; the only feature of importance to the inventive process is simply the provision of metallized through holes.

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L1: Entry 151 of 191 File: USPT Aug 18, 1992

DOCUMENT-IDENTIFIER: US 5139642 A
TITLE: Process for preparing a nonconductive substrate for electroplating

Brief Summary Text (22):
U.S. Pat. No. 4,897,164, which issued Jan. 30, 1990, describes contacting a printed wiring board with an aqueous solution of an alkali metal borate after it has been contacted with the carbon black dispersion and prior to microetching.

CLAIMS:

10. The process for electroplating the walls of through holes in a laminated printed wiring board comprised of at least one nonconducting layer laminated to at least two separate conductive metal layers, said process comprising the steps:

(a) contacting said printed wiring board having said through holes in a bath of a liquid carbon black dispersion comprised of:

(1) carbon black particles having an average particle diameter of less than about 3.0 microns in said dispersion;

(2) an effective dispersing amount of a surfactant which is compatible with said carbon black; and

(3) a first liquid dispersing medium wherein the amount of carbon black is sufficient to coat substantially all of said nonconducting surfaces and is less than about 4% by weight of said liquid carbon black dispersion;

(b) separating substantially all of the liquid dispersing medium from said dispersion, thereby depositing said carbon black particles in a substantially continuous layer on said nonconducting portions of said hole walls; and

(c) contacting said carbon black-coated printed wiring board with a liquid conductive graphite dispersion comprising:

(1) conductive graphite particles having an average particle diameter of less than about 1.5 microns in said dispersion;

(2) an effective dispersing amount of a surfactant which is compatible with said conductive graphite; and

(3) a second liquid dispersing medium, wherein the amount of conductive graphite is less than about 4% by weight of said liquid conductive graphite dispersion;

(d) separating substantially all of said second liquid dispersing medium from said conductive graphite particles, whereby said particles are deposited on said printed wiring board;

(e) microetching said metal layers of said printed wiring board to remove any deposited carbon black and graphite therefrom; and

(f) electroplating a substantially continuous conductive metal layer over the deposited carbon black layer and the deposited conductive graphite layer on said nonconductive portions of said hole walls, thereby electrically connecting said metal layers of said printed wiring board.

19. The process of claim 18 wherein said process further comprises a water rinse after said microetching step (e).

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L1: Entry 154 of 191 File: USPT Apr 14, 1992

DOCUMENT-IDENTIFIER: US 5104688 A
TITLE: Pretreatment composition and process for tin-lead immersion plating

Detailed Description Text (16):
The metallic surfaces which are contacted with the pre-dip solution typically will be treated even before that step to insure clean surfaces and/or to effect microetching of the metallic surface, all as well known in the art.

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L1: Entry 156 of 191 File: USPT Sep 17, 1991

DOCUMENT-IDENTIFIER: US 5049234 A
TITLE: Methods for removing stringers appearing in copper-containing multi-layer printed wiring boards

Brief Summary Text (5):
During the foil microetching that takes place immediately before electroless copper plating to provide good adhesion of copper, "stringers" are formed in copper foil containing multilayer substrates such as printed wiring boards. These stringers or tails are often formed from strands of copper, polymeric fiber, or both. These tails, which emanate from the rough brass side of copper foil in plated through-holes, act as nucleation sites for the electroless copper and can introduce stress raisers or planes of weakness in the plated layer. Such stringers can also lead to instability and cause barrel cracking (i.e., cracking in the walls of plated through holes) and electrical failures. Attempts to remove these stringers by contacting them with ammonium persulfate and other known etchants have failed.

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L1: Entry 157 of 191 File: USPT Aug 6, 1991

DOCUMENT-IDENTIFIER: US 5037482 A
TITLE: Composition and method for improving adhesion of coatings to copper surfaces

Brief Summary Text (3):
The composition of the invention removes contaminants from the copper surface (which in turn is adhered to an underlying substrate) and enhances the surface topography thereof by controlled conversion of the copper surface from a relatively smooth surface to a micro-roughened surface, through a microetching which removes, e.g., from about 0.5 to 5 microns of the copper. In this way, a copper foil laminate for use as a printed circuit board is provided with improved adhesion characteristics to enable subsequently applied photoresist or oxide coatings to more easily and completely adhere to the copper surface. More particularly, the invention relates to an improved cleaning and adhesion promoter composition which is capable of concurrently bringing about both cleaning and microetching of the copper surface to improve the adhesion characteristics of the copper surface prior to the application of photoresist or oxide coatings to the copper surface in the manufacture of printed circuit boards.

Brief Summary Text (20):
The foregoing composition is effective not only in removing soils and the like (e.g., the chromate and/or triazole tarnish inhibitor films present on copper foil-clad substrates by reason of the copper foil lamination process), but concurrently also in roughening the surface by converting the substantially smooth copper surface to a substantially uniformly micro-roughened copper surface by means of a microetching of from about 0.5 to 5 microns of the copper thickness to enhance the adhesion characteristics of the copper surface for the subsequent application thereto of coatings such as photoresist or oxide coatings.

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L1: Entry 179 of 191 File: USPT Dec 23, 1986

DOCUMENT-IDENTIFIER: US 4631117 A
TITLE: Electroless plating process

Brief Summary Text (63):
In the case of a multilayer type board this microetching step is especially advantageous. Since, after the drying step, not only will the outer copper plates or foils be coated with carbon black but also the copper inner plates or foils exposed within the holes. Thus, this microetch procedure performs three very desirable tasks at once:

CLAIMS:

21. The process of claim 13 wherein said process further comprises microetching said metal layers of said printed wiring board after step (b) and before step (c) to remove any deposited carbon black therefrom.

22. The process of claim 21 wherein said process further comprises a water rinse after said microetching.

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L1: Entry 190 of 191 File: USPT Sep 23, 1975

DOCUMENT-IDENTIFIER: US 3907650 A
TITLE: Photosensitive binder layer for xerography

Brief Summary Text (21):
These and other objects of the instant invention are accomplished by microetching a nickel or nickel-coated substrate such as metallized paper or metallized plastic belt with an etching composition an inorganic acid, inclusive of phosphoric, sulfuric, or composition comprising acid, or combination thereof, in the presence of at least one of palladium chloride, chloroplatinic acid or ferric sulfate. This step is followed by anodizing the resulting microetched chemically oxidized substrate, preferably by immersing the substrate as an anode in an electrolytic bath and/or by glow discharge such as described, for instance, by Ignatov in J. Chimie Physique, 54 (1957) pg. 96 et seq.

Brief Summary Text (26):
The microetching step, on the other hand, can be usefully carried out at a somewhat higher temperature range of about 20.degree.C - 110.degree.C and for a period of about 2-15 minutes. Where increased concentration and/or differences in temperature are permitted, however, the treatment time can be varied somewhat without substantially affecting the desired properties.

Detailed Description Text (4):
B. An identical nickel test belt identified as A-2 is treated as in procedure "A" (supra) with the exception that the rinsing step in deionized water prior to microetching is extended to a full 5 minutes.

Detailed Description Text (16):
A stain-free nickel test belt identical with those used in the preceeding examples and identified as A-9 is cleaned and rinsed, then microetched at 60.degree.C for 10 minutes. Both the acid wash and etching baths are identical with Example II except that the etching solution contains 650 ml/liter of a 7:1 by volume of concentrated H.sub.3 PO.sub.4 /HCl solution. The etched nickel belt is otherwise treated identically with Example II. The microetching and the oxide layer on the belt is found to be of comparable quality to that obtained in Examples II and III (i.e., A 3-4).

CLAIMS:

1. In a process for producing a photoreceptor element comprising a nickel or nickel-coated substrate and a photoconductive layer joined in good blocking and charge-injection preventing contact with the substrate through at least two intermediate nickel oxide blocking layers arranged between the substrate and the photoconductive layer the improvement comprising

microetching and chemically oxidizing the nickel or nickel-coated substrate with a composition comprising an inorganic acid selected from the group consisting of phosphoric acid, sulfuric acid and hydrochloric acid, in the presence of at least one of palladium chloride, chloroplatinic acid, or ferric sulfate;

anodically oxidizing the resulting microetched chemically oxidized substrate; and

depositing a selenium-containing photoconductive layer upon the treated substrate to obtain the desired photoreceptor element.

4. The process of claim 1 wherein the microetching step is effected with an etching bath comprising phosphoric acid and chloroplatinic acid.

5. The process of claim 1 wherein the microetching step is effected with an etching bath comprising phosphoric acid and palladium chloride.

6. A process for producing a photoreceptor element comprising a nickel or nickel-covered substrate and a selenium-containing photoconductive layer joined in good blocking contact through at least two intermediate blocking layers arranged between said substrate and the applied photoconductive layer, comprising

a. microetching the nickel or nickel-coated substrate with an etching composition comprising

9. The process of claim 6 wherein the microetching step is effected with an etching bath comprising phosphoric acid and potassium chloride.

12. The process of claim 6 wherein the microetching step is effected with an etching bath comprising sulfuric acid and ferric sulfate.

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L1: Entry 184 of 191 File: USPT Jun 15, 1982

DOCUMENT-IDENTIFIER: US 4335295 A
TITLE: Method of marking a metal device

Detailed Description Text (5):
Nital is by far the most widely used etchant for microetching of carbon and alloy steels because it produces the maximum contrast between pearlite and cementite or ferrite network. Nital also develops ferrite boundaries in structures consisting of martensite and ferrite. Picral reveals maximum detail in pearlite, untempered and tempered martensite, and bainite and it differentiates ferrite, martensite and massive carbide by coloration. Super picral provides good resolution of carbide structures. The addition of hydrochloric acid to picral brings about radical changes in the etching behavior of picral, the most significant of which is the ability to reveal in untempered and tempered martensite the outlines of prior austenite grains. Other etchants are available to provide differential etching rates for different microstructures of metal alloys.

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L1: Entry 183 of 191 File: USPT Oct 28, 1986

DOCUMENT-IDENTIFIER: US 4619741 A
TITLE: Process for preparing a non-conductive substrate for electroplating

Brief Summary Text (63):
In the case of a multilayer type board this microetching step is especially preferred. Since, after the drying step, not only will the outer copper plate or foil be coated with carbon black but also the copper inner plates or foils exposed within the holes. Thus, this microetch procedure performs three very desirable tasks at once:

CLAIMS:

21. The process of claim 13 wherein said process further comprises microetching said metal layers of said printed wiring board after step (b) and before step (c) to remove any deposited carbon black therefrom.

22. The process of claim 21 wherein said process further comprises a water rinse after said microetching.